

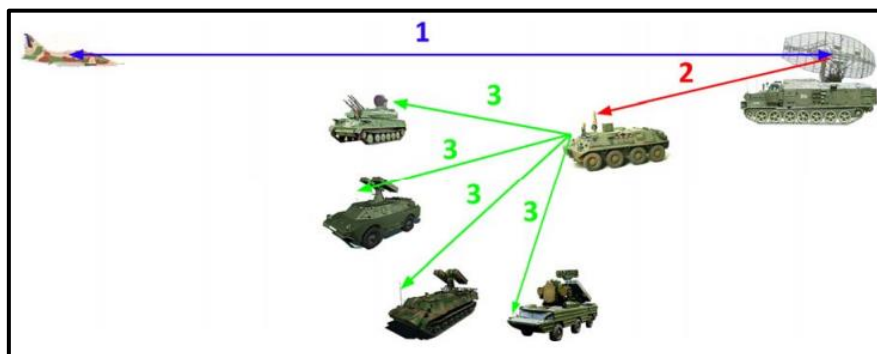
IADS equipment of army air defense

Similar to homeland air defense units coordination is required to make more effective the equipment of the army air defense. The task is difficult because the SAM and AAA units are mobile and the environment is much more dynamic comparing to static homeland air defense. Today the coordination can be ensured even from the MANPAD equipped infantry level up to the longest range theater level S-300V category SAM. During the Cold War IR/radar SHORAD and AAA units – Strela-1 (SA-9), Osa (SA-8) or ZSU-23-4 Shilka – had different kind of IADS support.

Not only the quantity and quality of air defense equipment but also the available IDAS equipment was very different between the Soviet Union and the NSWP countries and other 3rd World country operators. In NSWP countries each regiment had one 9S482 BTR-60 PU-12 mobile air defense command post. (Nominally each regiment had two air defense platoon, see in the summarizing chart in structure and organization part).



The 9S482 Mobile Air Defense Command Post is based on the BTR-60 armored personnel carrier. The turret was replaced by a telescopic antenna (16 m max height) giving 25-30 km range and inside an air defense Command station was added.



1. Division-level radio technical troops detect an incoming target.
2. The target coordinates are sent to the 9S482 BTR-60 PU-12 via digital datalink channel
3. Target information is transmitted to the ZSU-23-4V1 Shilka, 9K33 OSA (SA-8 Gecko), 9K31 Strela-1 (SA-9 Gaskin), or 9K35 Strela-10 (SA-13 Gopher) batteries via radio (voice channel) which can prepare to the target engagement.

Even with this slow method comparing to fully digital datalink channel the units can work much quickly because of the time of the search and target acquisition is spared and/or lowered and Osa could engage targets without turning its target acquisition (SOC) radar which is a very useful thing in case of AGM-88 and SEAD activity. (The wavelength of the SOC is inside the capability of the AGM-88 HARM.) The BTR-60 PU-12 was capable to establish datalink with P-15, P-18, P-19 and P-40 radars.¹

¹ The listed radars are the target acquisition radars of homeland air defense (SAMs) In the army the divisions had radio technical units and every 2K11 Krug (SA-4) regiment/brigade also had one P-40 radar with one PRV-16 heightfinder radar which was assigned to the army and well as radars of the 2K12 Kub (SA-6) division. These provided the data for the BTR-60 PU-12.

Because of the delay and limited capability of the voice channel was goal to improve the “bandwidth” the IADS. For this purpose was designed the PPRU-1 SOC battery command post with much more advanced capabilities. The PPR-1 used the OVOD-M-SV (Dog Ear) X band radar for target acquisition therefore the command post is not solely dependent from higher level radars at shorter range the command post can provide situational awareness and target coordinates for the air defense vehicles. The nominal detection range against fighter size target is about 80 km. The PPR-1 can support three platoons which means it can feed target coordinates the 1+1 platoon of ZSU-23-4 (with four vehicles) and Strela-10M (also with four vehicles) and the two 9K33 Osa-AK/AKM vehicles which are assigned to regiments (except the reserve regiment).

The PPRU-1 was used exclusively by the Soviet Union the NSWP countries had only the 9S482 PU12 command post. The more advanced M1-2 variant of this vehicles uses the VNIIRT 9S80M1-2 X band radar.² The successor system of the PPRU-1 is the 9S80M1-2 Barnaul-T.³ It is quite interesting the evolution line of the PU-12 is still kept alive the latest iteration is the PU-12M7⁴



Above left is the PPRU-1 M1-2 command post in 2007 at MAKS exhibition above right is the Cold War variant of the system with analogue radar.

The 9S737 Ranzhir-M⁵ is capable to feed with target coordinates for 4x Tor-M1 and 6x Strela-10M2/3 or Tunguska-M via digital datalink instead radio voice communication. The purpose of the 9S737 Ranzhir-M is the same as was with PPR-1 but instead 4+4+4 for 4+6 vehicles because 6x2K22M Tunguska-M replaced the 4+4 Strela-10M and ZSU-23 Shilka. (Not in every regiments, Strela-10M3/4 are still in service 2019). The Ranzhir-M is clearly a post-Cold War equipment it was not prepared to command as many vehicles what was necessary before the 2K22M. It is also a strange change comparing to PPRU-1/Barnaul command post that it does not have its own radar it relies on higher level target acquisition radars and datalink.

² http://www.almaz-antey.ru/en/catalogue/military_catalogue/1220/1327

³ <http://roe.ru/eng/catalog/air-defence-systems/barnaul-t/>
<http://www.npp-rubin.ru/index.php?itsfltinside=1&fulnro=38&thisissx=zuzzzla&lang=en>

⁴ <http://roe.ru/eng/catalog/air-defence-systems/pu-12m7/>

⁵ <http://roe.ru/eng/catalog/air-defence-systems/ranzhir-m1/>
<http://pvo.guns.ru/asu/ranzhir.htm> , <http://pvo.guns.ru/asu/ranzhir-m.htm>



Above left is the 9S933, above right is the 9S935.

Today the even for MANPAD carrier crew is possible to provide coordinates from higher level radars using small size portable displays (9S933), moreover with night vision sights and optics (9S935) is possible to provide information similar to HUDs for the MANPAD operator about the bearing and or even heading of the target which makes possible to launch missile even at night. ⁶ (This feature is also mentioned at the description of the 9K35 Strela-10M)



The Cold War era variant of the 9S737 and its interior.



On truck is the 9S737M the interior shows this is the latest variant of the system. Of course tracked variant is also available of the command post.

⁶ <http://www.npp-rubin.ru/index.php?itsfltinside=1&fulnro=45&thisissx=zuzzzla&lang=en>
<http://www.npp-rubin.ru/index.php?itsfltinside=1&fulnro=50&thisissx=zuzzzla&lang=en>

⁷ <http://www.flak11.de/AFLK%20K1.htm>



The 9S52 Polyana-D4

The 9S52 Polyana-D4⁸ has been mentioned in the section about 9K37M Buk-M1 system. This command post is not only the command post of the Buk-M1 battalions but it also coordinates the work of Buk-M1 (M2 or M3 variants) and S-300V/VM brigades, moreover it was the first joint command post which could establish connection both with army and homeland air defense units as well as with Beriev A-50 AWACS (today A-50M or A-100).

The Buk brigade itself does not have its own unique command post such as the 9S457 KP as the S-300V brigade the Polyana-D4 fulfils this role besides being a “hub” which forward target data for lower level units.

The 9S18M1 Kupol radar of the Buk-M1 battalions is not the best fitted for detecting and tracking ballistic missiles therefore the Buk brigade relies mostly on the dedicated ABM radar of the S-300V.

According some sources the Buk-M1 variant did not have ABM capability at all but Finnish crew during the final live exercise was able to shoot down sort ranges ballistic missiles at the first attempt. The Buk-M1-2 has ABM capability as well as later variants.

In case of a large scale conventional war between the NATO and the WPACT very likely the four battalions of the Buk-M1 brigade would be dispersed along the frontline which made pointless the close coordination with S-300V very likely this is why does not have even today and own command post and also does not have a brigade level long range target acquisition radar.

The first Buk-M1 brigade entered in service in 1987 and even at the end of Cold War only three S-300V brigades existed (Kaliningrad, Ukraine, Moscow) and only two Buk-M1 (one in Hungary, one in East Germany). The aimed full capability became available long before the Cold War because of the limited operational capability of very early A-50. (See in chapter 2). The Polyana-D4 in fact is a Front level command post. (The extent and function of the digital datalink capability of the 9S52 is similar to the American TADIL-J datalink.)

This limited quantity had quite a serious impact about the S-300V and Buk-M1 capabilities as well as on older SAMs. Because normally every Front⁹ had one brigade S-300V and the two armies of the Front 1-1 brigade BuK-M1 it meant in case an corps had the S-300V but one army did not have Buk-M1 it also meant the Polyana-D4 was also missing. In this case such level of datalink connection between lower level units (down to the SHORAD units) is not available as would be with a Buk-M1 brigade.

⁸ http://pvo.guns.ru/asu/polyana_d4.htm
<http://roe.ru/eng/catalog/air-defence-systems/polyana-d4m1/>

⁹ This is a level in military organization typically is consisted by two armies, sometimes three. The structure and organization of the Soviet and WPACT forces is explained at the beginning of the army air defense chapter.

The function and role of A-50 AWACS is not exactly clear in the commanding interceptions and commanding of fighters. It is sure the A-50 is able to forward data to both for army air defense units and homeland air defense. Very likely the operators on the A-50 were not aware about the fighters ready to intercept on the ground and about reserves (either fighters or SAMs) only the higher level ground units of the IDAS. Comparing to E-3 Sentry the early A-50 maybe just was a different type of radar in the IADS system but not a high capacity command post for intercept operators. The most likely route of the data flow and the command chain is the A-50 → ground based IADS systems → target coordinate to fighter.

Below is a gallery about the Russian command posts and systems:

<http://www.ousairpower.net/APA-Rus-ADCP-CP.html>